

**WHAT IS CLAIMED IS:**

1. A belt drive continuously-variable transmission control apparatus comprising:
  - a belt drive continuously-variable transmission unit
  - 5 including a primary pulley adapted to be connected with an engine through a torque converter, and a secondary pulley connected with the primary pulley by a V belt;
  - a shift control valve to control a fluid pressure to the primary pulley;
  - 10 a shift control section to control an actual transmission ratio of the continuously-variable transmission unit by controlling the shift control valve;
  - a line pressure control section to control a line pressure to be supplied to the shift control valve and the
  - 15 secondary pulley, in accordance with an estimated input torque to the continuously-variable transmission unit; and
  - an input torque estimating section to determine the estimated input torque in accordance with a speed ratio and a torque ratio of the torque converter, the input
  - 20 torque estimating section including;
    - a speed ratio monitoring subsection to examine whether the speed ratio is in an increasing state; and
    - a torque ratio setting subsection to decrease the torque ratio when the speed ratio is in the increasing
    - 25 state so that the torque ratio at a given value of the speed ratio becomes smaller when the speed ratio is in the increasing state than when the speed ratio is in a decreasing state.
- 30 2. The belt drive continuously-variable transmission control apparatus as claimed in Claim 1, wherein the input torque estimating section further includes:

a torque ratio variation monitoring subsection to detect a rate of change of the torque ratio;

a torque ratio changing direction discriminating subsection to examine whether the torque ratio is in a decreasing direction or not; and

a torque ratio variation limiting subsection to limit a change of the torque ratio when the torque ratio is in the decreasing direction.

10 3. The belt drive continuously-variable transmission control apparatus as claimed in Claim 2, wherein the torque ratio variation limiting subsection is configured to impose no limitation on the change of the torque in an increasing direction, and to impose limitation on the  
15 change of the torque ratio in the decreasing direction.

4. The belt drive continuously-variable transmission control apparatus as claimed in Claim 1, wherein the shift control section is configured to determine a target  
20 transmission ratio in accordance with a vehicle operating condition of a vehicle including the engine and the torque converter and to control the actual transmission ratio of the continuously-variable transmission unit so as to achieve the target transmission unit; and the input torque  
25 estimating section of the line pressure control section is configured to calculate the speed ratio of the torque converter, to determine the torque ratio of the torque converter in a first mode when the speed ratio is in the increasing state), and in a second mode when the speed  
30 ratio is not in the increasing state, and to determine the estimated input torque in accordance with the torque ratio and an engine torque.

5. A belt drive continuously-variable transmission control apparatus comprising:

an actual transmission ratio calculating section to determine an actual transmission ratio of a belt drive continuously-variable transmission unit;

an engine torque calculating section to calculate an engine torque of an engine;

a torque converter speed ratio determining section to determine a torque converter speed ratio of a torque converter output speed to a torque converter input speed of a torque converter connected with the engine;

a speed ratio monitoring section to examine whether the torque converter speed ratio is in an increasing state;

a torque ratio setting section to set a torque ratio according to a first characteristic of the torque ratio with respect to the speed ratio when the speed ratio is in the increasing state, and according to a second characteristic of the torque ratio with respect to the speed ratio when the speed ratio is not in the increasing state;

an input torque estimating section to determine an estimated input torque to the belt drive continuously-variable transmission unit, in accordance with the torque ratio and the engine torque; and

a line pressure control section to control a line pressure for the belt drive continuously-variable transmission unit in accordance with the actual transmission ratio and the estimated input torque.

6. The belt drive continuously-variable transmission control apparatus as claimed in Claim 5, wherein the first characteristic is lower than the second characteristic so that the torque ratio at a given value of the speed ratio

becomes smaller when the speed ratio is in the increasing state than when the speed ratio is in a decreasing state.

7. The belt drive continuously-variable transmission control apparatus as claimed in Claim 5, wherein the first  
5 characteristic is a characteristic determined from a characteristic of the torque converter.

8. The belt drive continuously-variable transmission control apparatus as claimed in Claim 5, wherein the  
10 second characteristic is a characteristic offset from the first characteristic in a positive direction of the speed ratio by a predetermined amount.

9. A belt drive continuously-variable transmission control method comprising:

a first step of determining an actual transmission ratio of a belt drive continuously-variable transmission unit;

20 a second step of calculating an engine torque of an engine;

a third step of determining a torque converter speed ratio of a torque converter output speed to a torque converter input speed of a torque converter connected  
25 with the engine;

a fourth step of examining whether the torque converter speed ratio is in an increasing state;

a fifth step of setting a torque ratio according to a first characteristic of the torque ratio with respect to the  
30 speed ratio when the speed ratio is in the increasing state, and according to a second characteristic of the torque ratio with respect to the speed ratio when the speed ratio is not in the increasing state;

a sixth step of determining an estimated input torque to the belt drive continuously-variable transmission unit, in accordance with the torque ratio and the engine torque; and

- 5        a seventh step of controlling a line pressure for the belt drive continuously-variable transmission unit in accordance with the actual transmission ratio and the estimated input torque.

- 10    10.    The belt drive continuously-variable transmission control method as claimed in Claim 9, wherein the second characteristic is a characteristic offset from the first characteristic in a positive direction of the speed ratio by a predetermined amount.